1.0 Introduction

The purpose of this memorandum is to document the procedure used to develop the base year truck tables for the Southwest Georgia Interstate Study travel demand model. The truck trip tables developed from this process represent average annual truck trips by different commodity groups. Several available freight plans in Georgia were reviewed prior to development of the freight truck trip tables for Southwest Georgia Interstate Study. The plans and or studies that were reviewed and their freight data sources are shown in the list below.

- Georgia Statewide Truck Lane Needs Identification Study (2004 Transearch data)
- Georgia Statewide Transportation Plan (1998 Transearch data)
- Central Georgia Corridor Study (1998 Transearch data)
- Georgia Interstate System Plan (1998 Transearch data)
- Albany Freight Plan (Registration data from R.L. Polk's National Vehicle Population Profile)
- Columbus Phenix City LRTP (1998 FAF data)

The freight data in these plans are relative old compared with the latest available freight data provided by Federal Highway Administration's (FHWA) and other private data sources. In addition, the focus of study and the level of detail required in both the Traffic Analysis Zones and model network are quite different between the Southwest Interstate Study and these available plans. Based on current resources and data available, it is decided that FHWA's latest 2006 Freight Analysis Framework (FAF^2) database be used to develop the truck trip tables.

The FHWA's Office of Freight Management and Operation has developed the FAF^2 database as a policy tool to estimate commodity flows at national and regional levels. It covers the domestic freight flows among the U.S. States, the North America flows to and from Canada and Mexico, as well as major international freight movements in and out of nation's major ports. The latest FAF database version available at the time is the FAF^2 2006 provisional database. The database provides origin-destination (O-D) commodity flows among 138 FAF regions which include major U.S. metropolitan areas, major ports, individual states, as well as North America trade regions and International regions overseas. The truck table development process involves the conversion of commodity in tonnage to truck loads, aggregation of similar commodity types into groups, and disaggregation of the FAF regions into the 1,564 zones in the Southwest Georgia Interstate travel demand model. The developed truck tables from this process then will be calibrated and validated by checking the network link volumes from the trip table assignment results.

1.1 FAF² Freight Analysis Framework Database

The FHWA, in cooperation with other U.S. Department of Transportation (DOT) modal administrations having freight responsibilities, developed the first Freight Analysis Framework (FAF, or FAF¹) commodity-based freight flow O-D data. The FAF¹ O-D data were derived from the 1997 Commodity Flow Survey (CFS) data and other public and private or proprietary databases. The new version of FAF² data reflects many improvements over the old FAF¹ data and uses the 2002 CFS and other public data sources. It is developed in part to address issues and lessons learned from FAF¹ data. The 2002 estimate is based primarily on the Commodity Flow Survey and other components of the Economic Census. In responding to significant commodity flow changes that occur during the period between each Economic Census, the FHWA also produces provisional estimate of commodity flow by origin, destination, and mode for the most recent calendar year. The latest FAF² database provides estimates for 2002 and the most recent year of 2006 plus forecasts through 2035.

The FAF² Commodity Origin-Destination Database estimates annual tonnage and value of goods shipped by commodity type and mode of transportation among and within the 114 U.S. regions, 17 international gateways, as well as the seven (7) international trading regions as listed in Table 1.1.1 through Table 1.1.3.

Table 1.1.1
FAF² 114 Domestic Regions

ID	Zone
1	Birmingham-Hoover-Cullman, AL CSA
2	Remainder of Alabama
3	Alaska
4	Phoenix-Mesa-Scottsdale, AZ MeSA
5	Tucson, AZ MeSA
6	Remainder of Arizona
7	Arkansas
8	Los Angeles-Long Beach-Riverside, CA CSA
9	San Diego-Carlsbad-San Marcos, CA MeSA
10	Sacramento--Arden-Arcade--Truckee, CA-NV CSA (CA Part)
11	San Jose-San Francisco-Oakland, CA CSA
12	Remainder of California
13	Denver-Aurora-Boulder, CO CSA
14	Remainder of Colorado
15	New York-Newark-Bridgeport, NY-NJ-CT-PA CSA (CT Part)

Table 1.1.1 (continued)
FAF² 114 Domestic Regions

ID	Zone
16	Remainder of Connecticut
17	Delaware
18	Washington-Arlington-Alexandria, DC-VA-MD-WV MeSA (DC Part)
19	Jacksonville, FL MeSA
20	Miami-Fort Lauderdale-Miami Beach, FL MeSA
21	Orlando-The Villages, FL CSA
22	Tampa-St Petersburg-Clearwater, FL MeSA
23	Remainder of Florida
24	Atlanta-Sandy Springs-Gainesville, GA-AL CSA (GA Part)
25	Remainder of Georgia
26	Honolulu, HI MeSA
27	Remainder of Hawaii
28	Idaho
29	Chicago-Naperville-Michigan City, IL-IN-WI CSA (IL Part)
30	St Louis, MO-IL MeSA (IL Part)
31	Remainder of Illinois
32	Chicago-Naperville-Michigan City, IL-IN-WI CSA (IN Part)
33	Indianapolis-Anderson-Columbus, IN CSA
34	Remainder of Indiana
35	Iowa
36	Kansas City, MO-KS MeSA (KS Part)
37	Remainder of Kansas
38	Louisville-Elizabethtown-Scottsburg, KY-IN CSA (KY Part)
39	Remainder of Kentucky
40	New Orleans-Metairie-Bogalusa, LA CSA
41	Remainder of Louisiana
42	Maine
43	Baltimore-Towson, MD MeSA
44	Washington-Arlington-Alexandria, DC-VA-MD-WV MeSA (MD Part)
45	Remainder of Maryland
46	Boston-Worcester-Manchester, MA-NH CSA (MA Part)
47	Remainder of Massachusetts
48	Detroit-Warren-Flint, MI CSA
49	Grand Rapids-Wyoming-Holland, MI CSA
50	Remainder of Michigan
51	Minneapolis-St Paul-St Cloud, MN-WI CSA (MN Part)

Table 1.1.1 (continued)
FAF² 114 Domestic Regions

ID	Zone
52	Remainder of Minnesota
53	Mississippi
54	Kansas City, MO-KS MeSA (MO Part)
55	St Louis-St Charles-Farmington, MO-IL CSA (MO Part)
56	Remainder of Missouri
57	Montana
58	Nebraska
59	Las Vegas-Paradise-Pahrump, NV CSA
60	Remainder of Nevada
61	New Hampshire
62	New York-Newark-Bridgeport, NY-NJ-CT-PA CSA (NJ Part)
63	Philadelphia-Camden-Vineland, PA-NJ-DE-MD CSA (NJ Part)
64	Remainder of New Jersey
65	New Mexico
66	Albany-Schenectady-Amsterdam, NY CSA
67	Buffalo-Cheektowaga-Tonawanda, NY MeSA
68	New York-Newark-Bridgeport, NY-NJ-CT-PA CSA (NY Part)
69	Rochester-Batavia-Seneca Falls, NY CSA
70	Remainder of New York
71	Charlotte-Gastonia-Salisbury, NC-SC CSA (NC Part)
72	Greensboro--Winston-Salem--High Point, NC CSA
73	Raleigh-Durham-Cary, NC CSA
74	Remainder of North Carolina
75	North Dakota
76	Cincinnati-Middletown-Wilmington, OH-KY-IN CSA (OH Part)
77	Cleveland-Akron-Elyria, OH CSA
78	Columbus-Marion-Chillicothe, OH CSA
79	Dayton-Springfield-Greenville, OH CSA
80	Remainder of Ohio
81	Oklahoma City-Shawnee, OK CSA
82	Tulsa-Bartlesville, OK CSA
83	Remainder of Oklahoma
84	Portland-Vancouver-Beaverton, OR-WA MeSA (OR Part)
85	Remainder of Oregon
86	Philadelphia-Camden-Vineland, PA-NJ-DE-MD CSA (PA Part)
87	Pittsburgh-New Castle, PA CSA
88	Remainder of Pennsylvania
89	Rhode Island

Table 1.1.1 (continued)
FAF² 114 Domestic Regions

ID	Zone
90	Greenville-Anderson-Seneca, SC CSA
91	Spartanburg-Gaffney-Union, SC CSA
93	South Dakota
92	Remainder of South Carolina
93	South Dakota
94	Memphis, TN-MS-AR MeSA (TN Part)
95	Nashville-Davidson--Murfreesboro--Columbia, TN CSA
96	Remainder of Tennessee
97	Austin-Round Rock, TX MeSA
98	Dallas-Fort Worth, TX CSA
99	Houston-Baytown-Huntsville, TX CSA
100	San Antonio, TX MeSA
101	Remainder of Texas
102	Salt Lake City-Ogden-Clearfield, UT CSA
103	Remainder of Utah
104	Vermont
105	Richmond, VA MeSA
106	Virginia Beach-Norfolk-Newport News, VA-NC MeSA (VA Part)
107	Washington-Baltimore-Northern Virginia, DC-MD-VA-WV CSA (VA Part)
108	Remainder of Virginia
109	Seattle-Tacoma-Olympia, WA CSA
110	Remainder of Washington
111	West Virginia
112	Milwaukee-Racine-Waukesha, WI CSA
113	Remainder of Wisconsin
114	Wyoming

Table 1.1.2
FAF² 17 International Gateways

ID	Zone
115	Anchorage, AK
116	Blaine, WA
117	International Falls, MN
118	Alexandria Bay, NY
119	Champlain/Rouses Point, NY

Table 1.1.2 (continued)
FAF² 17 International Gateways

ID	Zone
120	Portland, ME
121	Charleston, SC
122	Savannah, GA
123	Mobile, AL
124	Baton Rouge, LA
125	Morgan City, LA
126	Lake Charles, LA
127	Beaumont, TX
128	Corpus Christi, TX
129	Brownsville/Hidalgo, TX
130	Laredo, TX
131	El Paso, TX

Table 1.1.3
FAF² 7 International Trading Regions

ID	Zone
132	Canada
133	Mexico
134	Latin and South America
135	Asia
136	Europe
137	Rest of World
138	Middle East

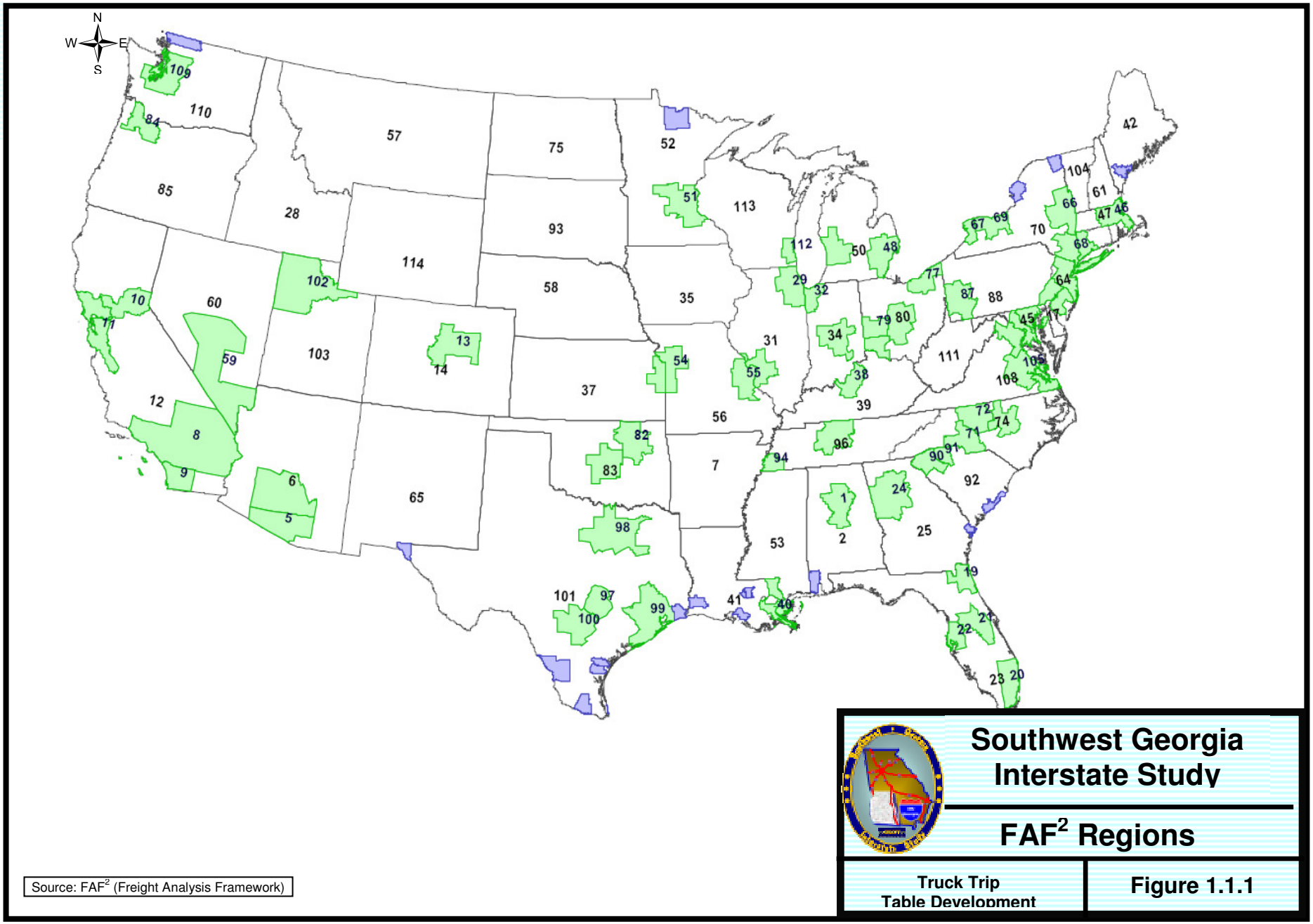
The O-D commodity flows in the FAF² database are established among all these 138 regions. The commodity flows are arranged and stored in the separate tables in the database based on the flow movement types, and represented in both total annual tonnage and values in dollar amount. Only the tonnage tables are used to develop the truck trip tables. The commodity tonnage tables in the FAF² database are:

- Border (International flows associated with Canada & Mexico)
- Domestic (All U.S. states)
- International Air (International flow with the 7 trading regions)
- Sea (International flow with the rest of 5 trading regions through Ports)

All tables except the International Air flow table contain commodity information shipped by trucks. During the trip table development, the Border and Domestic tables are combined into the North America table while the Sea table is the International Overseas table. Both tables contain the commodity flows interchange information among all the 138 FAF regions. The FAF^2 freight analysis region map is shown in Figure 1.1.1, and sample contents of the FAF^2 database is shown in Table 1.1.4.

Table 1.1.4
FAF^2 Database Contents

In each of these tables, the commodity flow is identified by origin, destination, commodity type, and transport mode. In both Sea and Border tables, each O-D commodity flow is also identified by a field called "POE", ports of entry, which represents the major U.S. Sea and Land ports. The "Origin" and "Destination" fields contain the names for all the 138 FAF regions, and "Ost" and "Dst" fields contain the abbreviation of the State in which the FAF region is located. The amount of the commodity shipped is expressed in thousands of tons.



Source: FAF^2 (Freight Analysis Framework)

Southwest Georgia Interstate Study

FAF^2 Regions

Truck Trip Table Development

Figure 1.1.1

The FAF[2] database categorizes the transportation modes into the following seven (7) different types.

- Truck
- Rail
- Water
- Air
- Truck-Rail Intermodal
- Parcels (U.S. Postal service or Courier), Truck-Water, and Water-rail
- Pipelines and Other Modes

The Truck mode includes the private and for-hire truck. Private trucks are trucks operated by a temporary or permanent employee of the owner of the shipment. For-hire trucks refer to trucks that carry freight for a fee collected from either the shipper, recipient of the shipment, or the arranger of the transportation. Table 1.1.5 shows the contents of the domestic ton table.

Table 1.1.5
FAF[2] Domestic Flow Table Contents

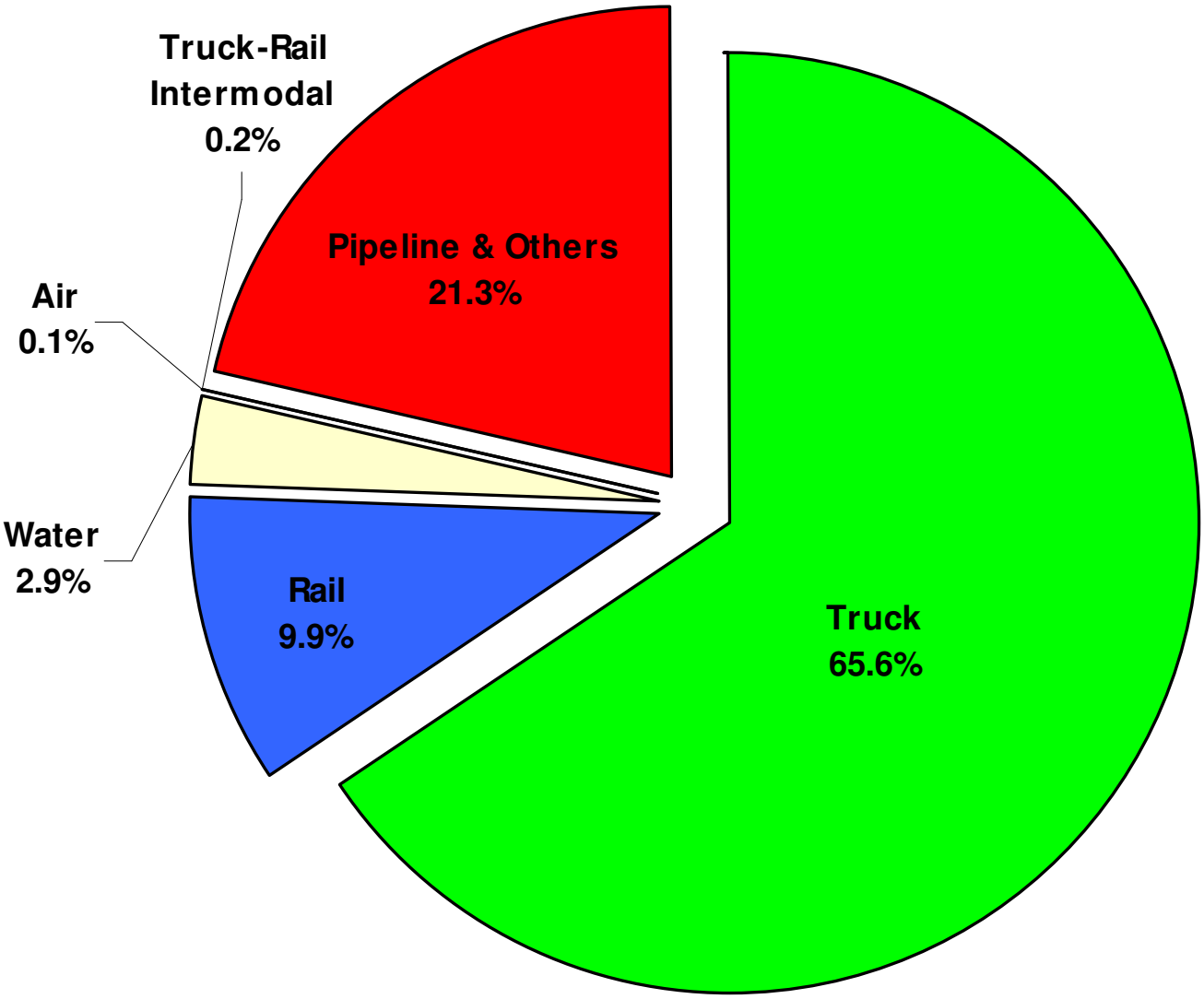
Domestic_06_Kton : Table

Origin	Ost	Destination	Dst	Commodity	Mode	Kton
OH Colum	OH	OH rem	OH	Motorized vehic	Pipeline & Unkr	86.74
LA rem	LA	IN Chica	IN	Crude petroleum	Pipeline & Unkr	17960.62
NY New Y	NY	NY New Y	NY	Motorized vehic	Pipeline & Unkr	158.65
LA rem	LA	IL Chica	IL	Crude petroleum	Pipeline & Unkr	17671.13
CA Los A	CA	CA Los A	CA	Electronics	Pipeline & Unkr	57.24
MI Detro	MI	MI Detro	MI	Furniture	Pipeline & Unkr	405.75
OR Portl	OR	OR Portl	OR	Motorized vehic	Pipeline & Unkr	169.17
CA San J	CA	CA San J	CA	Electronics	Pipeline & Unkr	56.84
OK rem	OK	OK rem	OK	Coal-n.e.c.	Pipeline & Unkr	5456.29
WA rem	WA	WA rem	WA	Gasoline	Pipeline & Unkr	9614.9
NE	NE	NE	NE	Pharmaceutical	Other Intermoda	0.94
IL Chica	IL	IL Chica	IL	Motorized vehic	Pipeline & Unkr	127.3
LA rem	LA	LA rem	LA	Fuel oils	Pipeline & Unkr	9103.81
PA rem	PA	NY rem	NY	Coal-n.e.c.	Pipeline & Unkr	5107.33
CA rem	CA	CA rem	CA	Coal-n.e.c.	Pipeline & Unkr	5173.81
IN rem	IN	OH Cinci	OH	Coal-n.e.c.	Pipeline & Unkr	4991.06
TX rem	TX	AR	AR	Coal-n.e.c.	Pipeline & Unkr	4984.48
TX Houst	TX	TX rem	TX	Basic chemical	Pipeline & Unkr	5067.65

Record: 1 of 323776

Commodities shipped by trucks account for over 65% of all commodity flows in the database, followed by Pipeline & Others, Rail, Water, Truck-Rail Intermodal, and Air. The commodities shipped by Truck-Rail Intermodal mode, however, are not included in the truck trip table development, because of lack of further details available regarding what intermodal facilities were used, how much commodity had been shipped by truck, and how far the commodities were shipped. In addition, the total tonnages associated with Truck-Rail Intermodal account for less than 1% of the total commodities shipped as shown in Figure 1.1.2. As a result, it was determined that the commodity flows related to the Truck-Rail Intermodal is insignificant compared with the total flows associated with the Truck mode and thus could be eliminated from further processing.

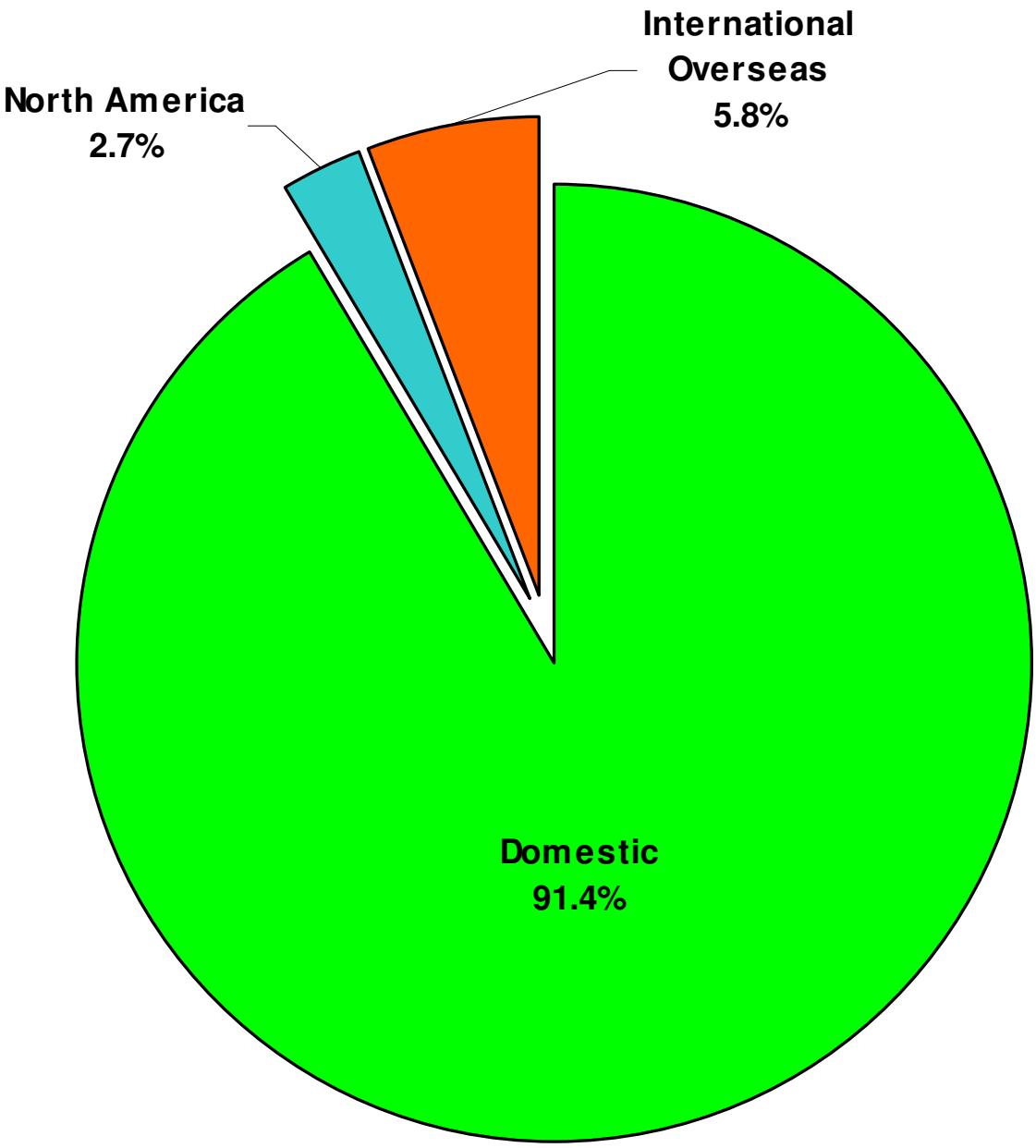
Among all freight types, the majority of the commodities shipped are within the domestic regions. According to the FAF[2] data, domestic flows account for over 91% of all commodities shipped; International Overseas accounts for 5.8% and North America accounts for 2.7%. Figure 1.1.3 shows annual tonnage share by commodity movement type.



Southwest Georgia Interstate Study

FAF^2 Mode Share

Truck Trip Table Development	Figure 1.1.2



Southwest Georgia Interstate Study

FAF^2 Commodity Share

Truck Trip Table Development	Figure 1.1.3

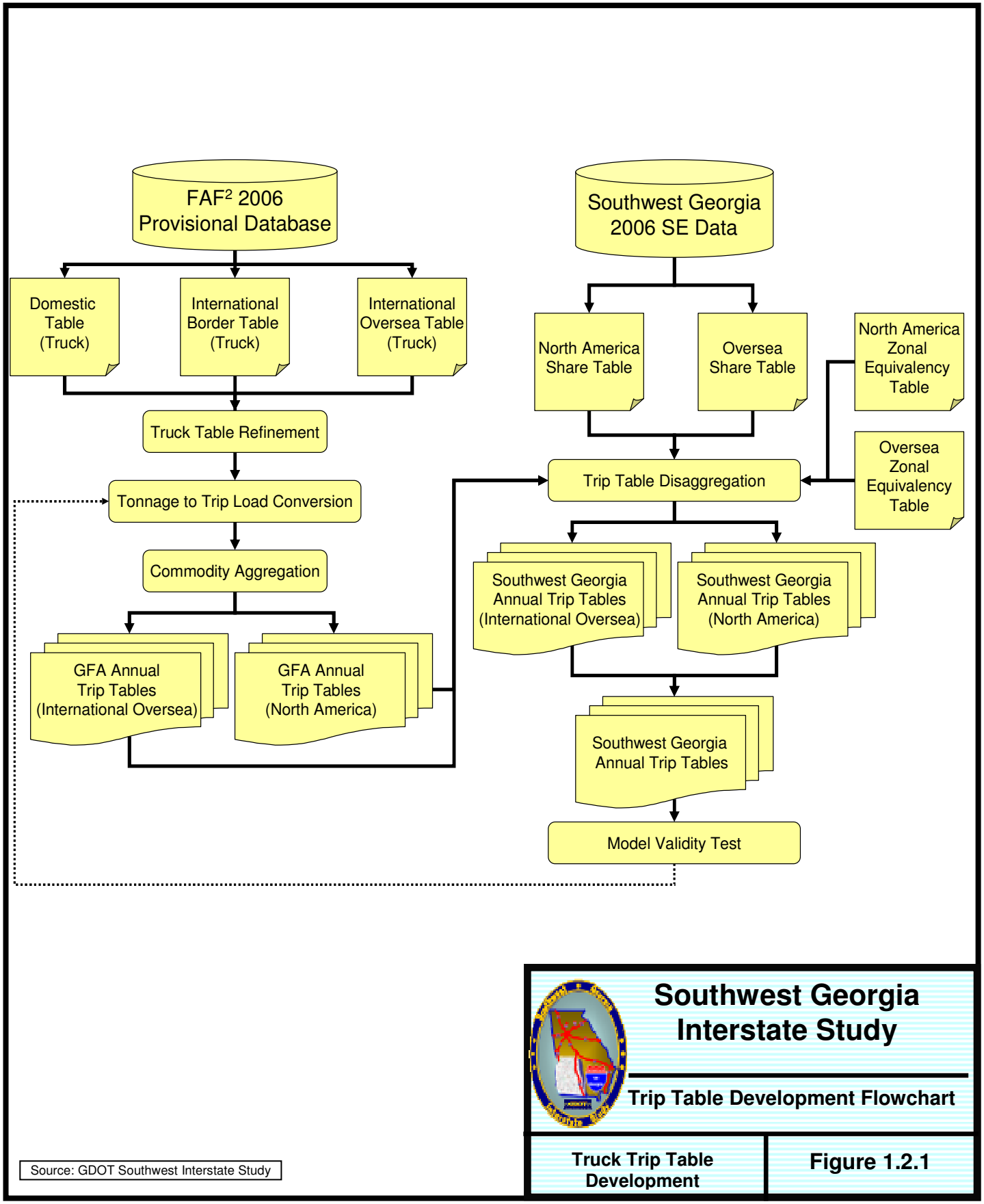
1.2 Development of Truck Trip Matrix

The first step in creating the truck trip tables is to develop FAF^2 regional trip tables from the database. The O-D flows in the FAF^2 database are organized into the 138 FAF regions as discussed in the previous section. Each O-D flow is identified by a commodity type, a shipping mode, and the annual tonnage and stored in Domestic, International Border, and International Overseas tables. The O-D flows from these three tables were combined to create the final trip tables, which reflect the total commodity movements during 2006.

The FAF regions are broad geographic areas that represent major U.S metropolitan areas, major sea ports, states, and International trade regions. The area of focus of the FAF is too coarse compared with that of the Southwest Georgia Interstate Model. The geographic analysis areas or traffic analysis zones in the Southwest Georgia Interstate Model were built in more detail within the Southwest Georgia area and were built in less detail in regions further away from the study area. The design of the Southwest Georgia Interstate TAZ system is presented in the Technical Memorandum for TAZ Development for Southwest Georgia Interstate. For this reason, the original FAF regions outside the six southeastern states, which include Georgia, Alabama, Tennessee, North Carolina, South Carolina, and Florida, are aggregated into states while regions within the six states are left intact. This reduces the 138 FAF regions into 67 Georgia Freight Analysis (GFA) zones. The refined trip tables therefore reflect the 67 GFA O-D points.

Since the FAF^2 database only supplies annual flows in tons between the O-D pairs, and the final trip table requires commodity flows expressed in average annual trips, a conversion from the commodity tonnage into truck loads had to be established. Because different commodity type constitutes different commodity characteristics, each commodity type has its own conversion factor. During this step, the 67 GFA regional tonnage trip tables are translated into truck tables. This is also the step where the conversion factors are adjusted during the trip table calibration process.

The FAF^2 database expresses the commodity flow in 43 Standard Classifications of Transported Goods (SCTG) commodity types. Once the conversion of commodity tonnage to truck loads has been performed, these commodity types are grouped into 12 aggregated commodity groups, and the truck loads from the aggregated commodity types are summed. This creates the commodity trip tables by the 12 major commodity groups. Commodity aggregation also keeps the amount of the commodity groups under a manageable level.


FAF² 2006 Provisional Database
Domestic Table (Truck)
International Border Table (Truck)
International Oversea Table (Truck)
Truck Table Refinement
Tonnage to Trip Load Conversion
Commodity Aggregation
GFA Annual Trip Tables (International Oversea)
GFA Annual Trip Tables (North America)
Southwest Georgia 2006 SE Data
North America Share Table
Oversea Share Table
North America Zonal Equivalency Table
Oversea Zonal Equivalency Table
Trip Table Disaggregation
Southwest Georgia Annual Trip Tables (International Oversea)
Southwest Georgia Annual Trip Tables (North America)
Southwest Georgia Annual Trip Tables
Model Validity Test
Source: GDOT Southwest Interstate Study
Southwest Georgia Interstate Study
Trip Table Development Flowchart
Truck Trip Table Development
Figure 1.2.1

While the resulting trip tables reflect only the 67 by 67 GFA zones, the Southwest Georgia Interstate Model contains 1,569 zones. The GFA regional truck trip tables were then disaggregated into new trip tables that include the 1,569 zones, so that commodity flows at sub-region and sub-areas could be reasonably estimated. The disaggregation of the GFA regional truck tables is based on the proportion allocation technique that uses socioeconomic (SE) data from the Southwest Georgia TAZs as the basis to calculate the appropriate freight share for the zones within each GFA region.

This process creates two sets of the GFA annual truck trip tables in 1,569 by 1,569 matrixes; one is for Domestic commodity flows plus the International North America flows, and the other is for International Overseas flows. The two sets of trips tables are then combined into the 12 commodity group trip tables used in the traffic assignment process. The truck trips assigned on the highway links are compared to the existing truck counts and adjustments to the trip tables are made in the tonnage to truck load conversion step to improvement the assignment of the truck trips. Figure 1.2.1 illustrates the process used in developing the annual truck tables from the FAF^2 Database.

1.2.1 Truck Table Refinement

The FAF^2 database contains three tables that store the commodity flows related to truck mode. Three tables are Domestic, International Border, and International Overseas Sea table. All origins and destinations in both Domestic, and International Border tables are located within U.S, Canada, and Mexico. Both tables directly reflect the commodity movement patterns across the U.S., and between trade partners of the two neighboring countries. Commodity flows associated with the truck mode are directly queried from these two tables.

The International Overseas table, however, contains commodity flows between locations inside U.S. as well as international destinations outside continental North America. It includes commodity flows related to the international trade region through the U.S ports. Therefore, the table can be viewed as a commodity flow data representing both U.S. imports and exports, because one end of the flow movement is located outside the U.S.. There are multiple means of transport method available at the ports and each O-D commodity flow in the International Overseas table is also identified by transport mode by which it was shipped. In addition, there is an extra data field in this table designated as "POE", port of entry, which identifies the U.S. ports where the shipment is unloaded for distribution within U.S. or loaded to be shipped overseas. Therefore, the ports are intermediate stops during a commodity movement. Depending on where the commodity will be shipped, ports of entry serve as either an origin or a destination of a commodity flow movement. In the International Overseas table, the origin or destination ends of a commodity flow that are located outside

continental North America are redefined according to the ports where shipments get handled. Table 1.2.1.1 shows a portion of the contents of the International Overseas table.

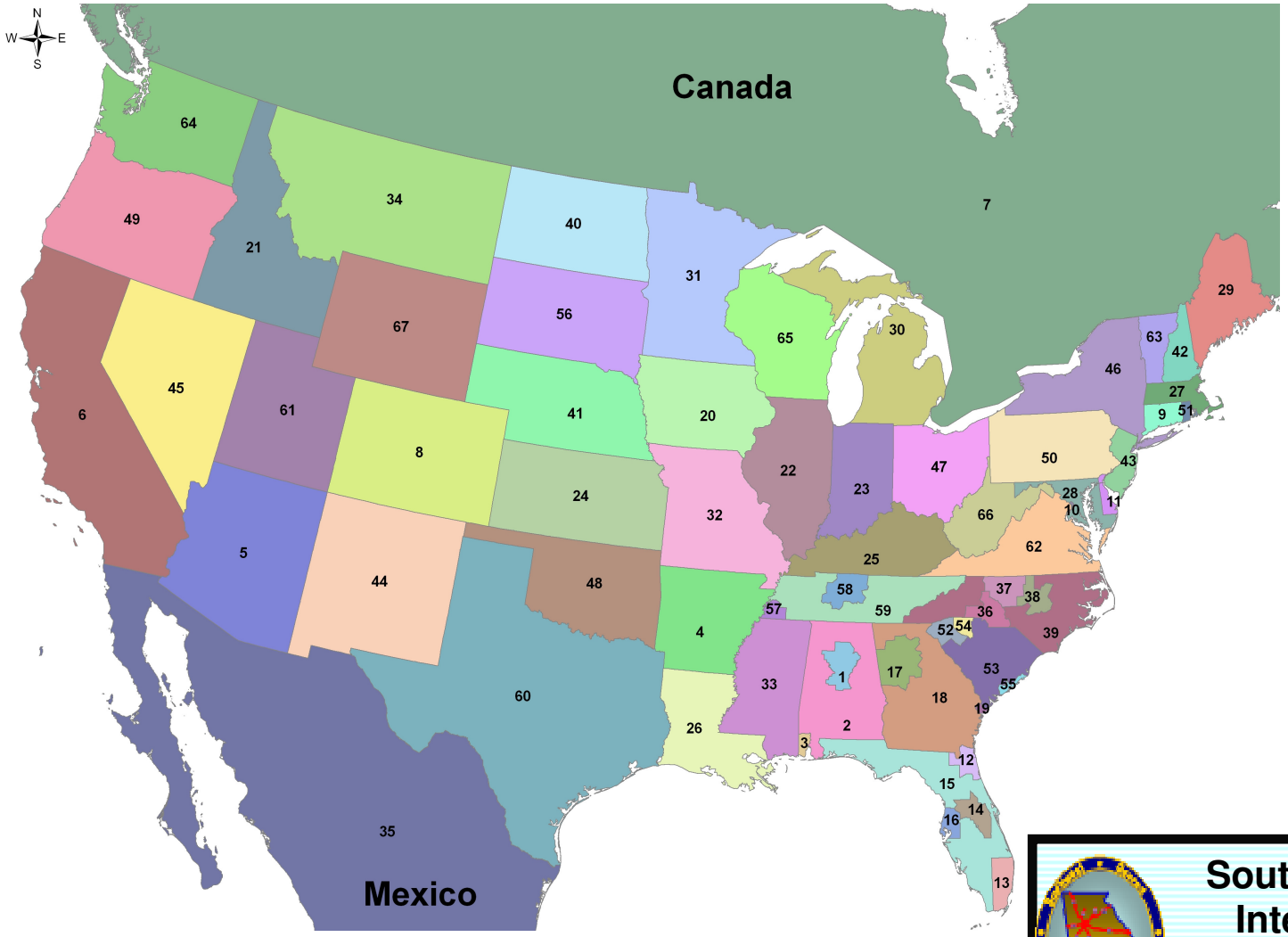
Table 1.2.1.1
FAF² International Overseas Table Contents

Origin	Ost	Destination	Dst	Commodity	Mode	POE	Kton
Canada	CN	AL Birmi	AL	Chemical prods.	Truck	CA Los A	0.66
Canada	CN	AL Birmi	AL	Nonmetal min. prods.	Truck	CA Los A	0.07
Canada	CN	AL Birmi	AL	Other ag prods.	Truck	CA San J	0.0087
Canada	CN	AL Birmi	AL	Chemical prods.	Truck	FL Jacks	0.06
Canada	CN	AL Birmi	AL	Paper articles	Truck	FL Jacks	0.03
Canada	CN	AL Birmi	AL	Other ag prods.	Truck	FL rem	0.005
Canada	CN	AL Birmi	AL	Natural sands	Truck	FL rem	0.0099

Major metropolitan areas across the nation in the FAF database are represented as independent freight analysis zones, while the rest of the state in which the metropolitan areas are located is designated as another larger zone. For example, there are five (5) FAF regions in the State of California as listed below.

- Los Angeles-Long Beach-Riverside (FAF Region 8)
- San Diego-Carlsbad-San Marcos (FAF Region 9)
- Sacramento--Arden-Arcade—Truckee (FAF Region 10)
- San Jose-San Francisco-Oakland (FAF Region 11)
- Remainder of California (FAF Region 12)

However, this zone structure does not coincide with the zone design of the Southwest Georgia Interstate model. The Southwest Georgia Interstate model considers the state of California as a single traffic analysis zone since the region is sufficiently far away from the study area. As a result, the freight flows within California can be ignored. The zone structure of the model primarily focuses on freight flows movement across or within Georgia and the surrounding southeastern states. For this reason, FAF regions representing major metropolitan areas in states outside the six southeastern states of Georgia, Alabama, Tennessee, North Carolina, South Carolina, and Florida, are aggregated into the state where they are located, while FAF regions in the six southeastern states are left intact. This aggregation method produces a total of 67 new regions named Georgia Freight Analysis (GFA) zones as shown in Figure 1.2.1.1. The refined FAF truck flow tables were built according to the 67 GFA zones.



Source: GDOT Southwest Interstate Study

Southwest Georgia Interstate Study

Georgia Freight Analysis Zones

Truck Trip Table Development

Figure 1.2.1.1

1.2.2 Conversion of Tonnage to Truck Loads

For freight related traffic analysis, it is important to know the number of trucks passing through the roadway system. The current FAF database only provides comprehensive commodity movement data in term of tonnage and value of commodity between the O-D pair. Consequently, it is necessary to develop truck loads from the tonnage in order to assign the truck trips onto the highway system.

The conversion factors differ by commodity group, since each commodity type will have different densities, shipment size, and require different truck body types. The conversion factors for calculating the truck trips were based on the Indiana Freight Model published in the Quick Response Freight Manual II, and adjustments for the factors were made during the trip table calibration process in which the assigned daily truck trips on the roadway were compared to actual truck vehicle counts. The commodity flows in the current FAF[2] database are represented in two-digit 43 SCTG commodity types. Each of the 43 SCTG commodity types has a conversion factor, and tonnages of the commodity are converted into truck loads before the commodity aggregation in the following step. Table 1.2.2.1 shows the average tonnage per truck by the 43 SCTG commodity types.

Table 1.2.2.1
Tonnage to Truck Loads Conversion Factors

SCTG	Commodity	Tons/Truck
1	Live animals/fish	3.9
2	Cereal grains	30.1
3	Other ag prods.	22.3
4	Animal feed	25.3
5	Meat/seafood	18.6
6	Milled grain prods.	21.4
7	Other foodstuffs	21
8	Alcoholic beverages	21
9	Tobacco prods.	18.3
10	Building stone	25.4
11	Natural sands	25.4
12	Gravel	25
13	Nonmetal min. prods.	24
14	Metallic ores	23
15	Coal	23
17	Gasoline	28.2
18	Fuel oils	22
19	Crude petroleum	25
20	Basic chemicals	17.5

Table 1.2.2.1 (continued)
Tonnage to Truck Loads Conversion Factors

SCTG	Commodity	Tons/Truck
21	Pharmaceuticals	13.2
22	Fertilizers	27.4
23	Chemical prods.	20.1
24	Plastics/rubber	13.3
25	Logs	29.2
26	Wood prods.	24.2
27	Paper articles	23.5
28	Newsprint/paper	17.2
29	Printed prods.	15.1
30	Textiles/leather	13.3
31	Nonmetallic minerals	23
32	Base metals	18.4
33	Articles-base metal	12.2
34	Machinery	13.8
35	Electronics	12.7
36	Motorized vehicles	13.3
37	Transport equip.	12.1
38	Precision instrument	9
39	Furniture	10.7
40	Misc. mfg. prods.	14
41	Waste/scrap	20
43	Mixed freight	14.2
-	Unknown	19

1.2.3 Commodity Aggregation

The types of commodities provided by the FAF[2] are shown in Table 1.2.3.1. The SCTG classification consists of a blend of transportation characteristics, commodity similarities, and industry-of-origin considerations, designed to create statistically significant categories.

Table 1.2.3.1
SCTG Commodity Group

SCTG Code	Commodity Class
1	Live animals and live fish
2	Cereal grains
3	Other agricultural products

Table 1.2.3.1 (continued)
SCTG Commodity Group

SCTG Code	Commodity Class
4	Animal feed and products of animal origin, not elsewhere classified (n.e.c.)
5	Meat, fish, seafood, and their preparations
6	Milled grain products and preparations, and bakery products
7	Other prepared foodstuffs and fats and oils
8	Alcoholic beverages
9	Tobacco products
10	Monumental or building stone
11	Natural sands
12	Gravel and crushed stone
13	Nonmetallic minerals n.e.c.
14	Metallic ores and concentrates
15	Coal
16	Crude Petroleum
17	Gasoline and aviation turbine fuel
18	Fuel oils
19	Coal and petroleum products, n.e.c.
20	Basic chemicals
21	Pharmaceutical products
22	Fertilizers
23	Chemical products and preparations, n.e.c.
24	Plastics and rubber
25	Logs and other wood in the rough
26	Wood products
27	Pulp, newsprint, paper, and paperboard
28	Paper or paperboard articles
29	Printed products
30	Textiles, leather, and articles of textiles or leather
31	Nonmetallic mineral products
32	Base metal in primary or semi-finished forms and in finished basic shapes
33	Articles of base metal
34	Machinery
35	Electronic and other electrical equipment and components and office equipment
36	Motorized and other vehicles (including parts)
37	Transportation equipment, n.e.c.
38	Precision instruments and apparatus
39	Furniture, mattresses and mattress supports, lamps, lighting fittings
40	Miscellaneous manufactured products
41	Waste and scrap
43	Mixed freight
—	Commodity unknown

To reduce the commodity types into a manageable amount, these SCTG groups are aggregated into 12 major commodity groups, in which the final truck trip tables will be based upon. The aggregated 12 major commodity groups are:

- Chemicals
- Construction & Mining
- Food and kindred Products
- Household goods & Other manufactures
- Lumber or Wood Products
- Machinery
- Miscellaneous MFG and Other Products
- Paper Products
- Primary Metal
- Waste Materials
- Unknown

The aggregation of the commodity groups is based on the similarities of the characteristics of the commodities. By aggregating the commodity types and creating truck trip tables for them, different factors for empty truck loads and the number of working day during a year can be applied by the commodity groups. Table 1.2.3.2 shows the equivalency between the 43 SCTG commodity types and the aggregated the commodity groups.

Table 1.2.3.2
SCTG Commodity Group

SCTG2	Commodity	Aggregated Commodity
20	Basic chemicals	Chemicals
23	Chemical prods.	
22	Fertilizers	
21	Pharmaceuticals	
10	Building stone	Construction & Mining
15	Coal	
15	Coal-n.e.c.	
19	Crude petroleum	
18	Fuel oils	
17	Gasoline	
12	Gravel	

Table 1.2.3.2 (continued)
SCTG Commodity Group

SCTG2	Commodity	Aggregated Commodity
14	Metallic ores	Construction & Mining
11	Natural sands	
13	Nonmetal min. prods.	
31	Nonmetallic minerals	
2	Cereal grains	Farm Products
1	Live animals/fish	
3	Other ag prods.	
8	Alcoholic beverages	Food and kindred Products
4	Animal feed	
5	Meat/seafood	
6	Milled grain prods.	
7	Other foodstuffs	
33	Articles-base metal	Household goods & Other manufactures
30	Textiles/leather	
25	Logs	Lumber or Wood Products
26	Wood prods.	
35	Electronics	Machinery
39	Furniture	
34	Machinery	
36	Motorized vehicles	
38	Precision instrument	
37	Transport equip.	
40	Misc. mfg. prods.	Miscellaneous MFG and Other Products
43	Mixed freight	
24	Plastics/rubber	
9	Tobacco prods.	
28	Newsprint/paper	Paper Products
27	Paper articles	
29	Printed prods.	
32	Base metals	Primary Metal
41	Waste/scrap	Waste Materials
-	Unknown	Unknown

Once the commodities have been aggregated and the total truck trips summed, the 67-zone GFA regional average tuck trip tables can be created and are ready to be disaggregated into the 1,569 Southwest Georgia Interstate model zones in the next step.

1.2.4 Disaggregation of the GFA Regional Matrix

The trip tables developed for the GFA regions only contain the O-Ds related to the 67 geographic areas. However, this aggregation level of GFA data still limits the ability to conduct reasonable freight demand analysis at the more detailed traffic analysis zone level in the Southwest Georgia Interstate model. The current Southwest Georgia Interstate model has 1,569 zones, and the majority of the smaller zones are located inside the southwest Georgia area. The available data for Georgia from the FAF[2] database is only at three geographic areas, Atlanta Metropolitan Area, Savannah Area, and the rest of Georgia. In some regions, commodity flow data is only available at one O-D point for a single state. To be able to accurately assign the freight traffic onto the Southwest Georgia Interstate network, one must disaggregate the GFA commodity flows into the 1,569 zones as shown in Figure 1.2.4.1.

The disaggregation process was performed using the proportional allocation technique at the Southwest Interstate model TAZ level. The commodity flow disaggregation was based on the proportion allocation by employment activity and household distribution data that reflects the intensity of commodity production and consumption for a particular zone. A weighted SE data was calculated for each of the 1,569 zones based on the existing number of households and employment and for each aggregated commodity group. The weighted SE data is the weighted result of zonal household and employment numbers. The calculation of the weighted SE data is based on the following equation.

$$\text{Weighted SE data} = \text{Household} * \text{Coefficient}_{(\text{Household})} + \text{Employment} * \text{Coefficient}_{(\text{Employment})}$$

For each aggregated commodity group, a set of coefficient factors for the household and employment data was developed respectively. Therefore, the importance of the household and employment toward a particular aggregated commodity group can be evaluated and adjusted independently. 12 sets of weighting factors for households and employment are developed based on the GFA trip tables created in the previous step. First, the total number of households and employment as well as the total number of truck loads originating and ending at each region are summed as shown in Table 1.2.4.1. The relationship between the number of truck loads and households and between the truck loads and employment are calculated by using the "least squares" method, which calculates a straight line that fits best to the observed data. The resulting equation is shown as follows.

$$\text{Truck Loads} = X * \text{Households} + Y * \text{Employment} + b$$

Table 1.2.4.1
Sample SE & Truck Summation for Chemicals

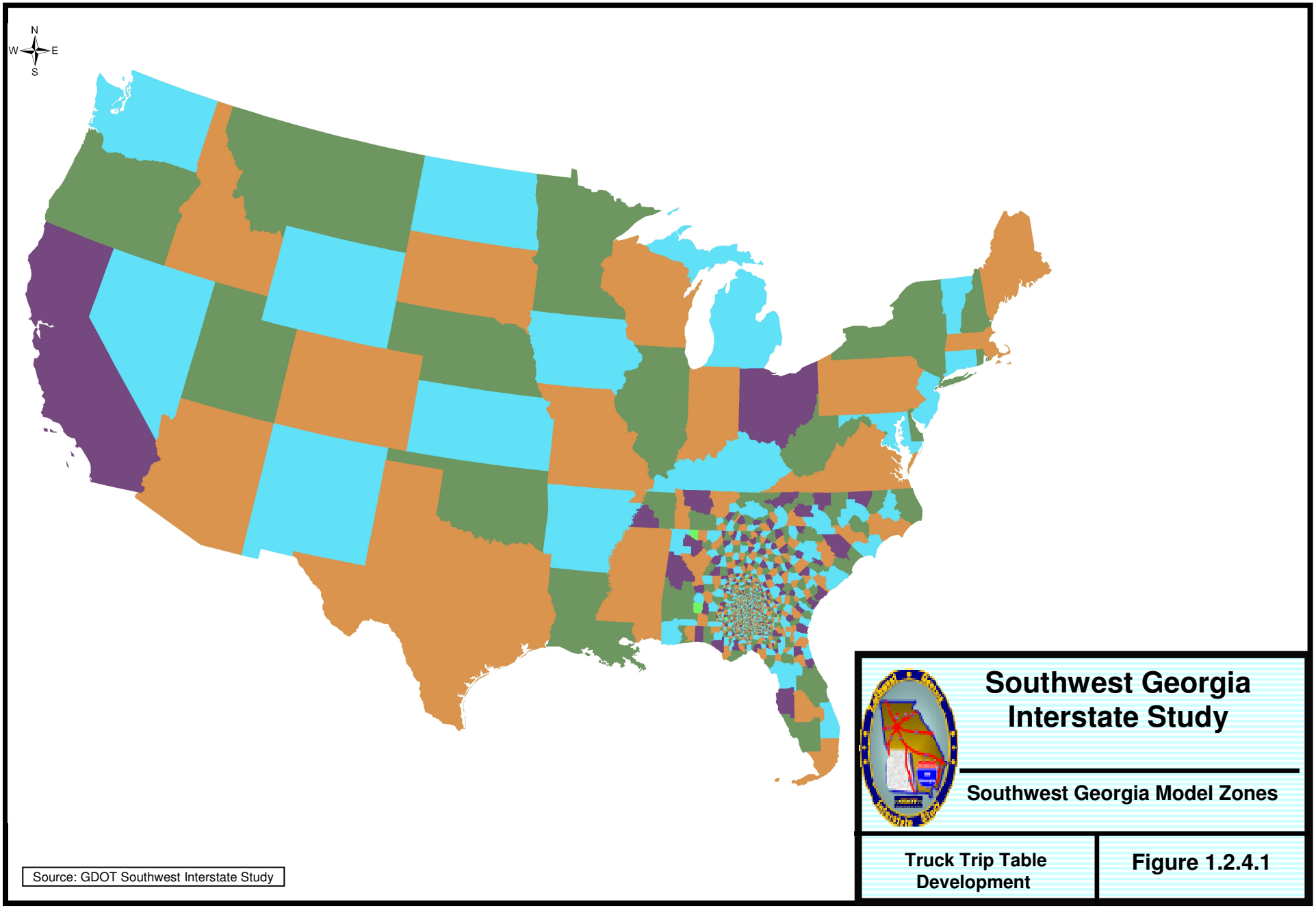
Georgia Freight Analysis Zones	Total Truck Loads	Households	Employment
1	262,643	528,050	715,143
2	958,284	1,405,440	1,643,855
3	57,708	176,664	231,044
4	517,905	1,601,339	5,000
5	658,738	3,366,201	4,000
6	6,450,198	20,525,491	6,000

The dependent value is the truck load which is a function of the independent values of households and employment. The X and Y values are the coefficient, each corresponding to households and employment respectively, and b is a constant value, which is set at "0".

The importance of the number of households and employment varies depending on different commodity groups. The resulting coefficients calculated for households and employment, to some extend, reflect the relative significance of the household and employment toward a particular group of commodity. The raw coefficients for households and employment that are estimated from the "least squares" method are weighted and a relative number for each coefficient is calculated based on the relative magnitude of the raw coefficients. The resulting coefficients for the 12 commodity groups are shown in the Table 1.2.4.2.

Table 1.2.4.2
Raw and Weighted Coefficients for SE data

	Raw Coefficient		Adjusted Coefficient	
Commodities	**Household**	**Employment**	**Household**	**Employment**
Chemicals	**0.38**	**0.13**	**0.74**	**0.26**
Construction & Mining	**2.45**	**0.89**	**0.73**	**0.27**
Farm Products	**0.65**	**0.16**	**0.81**	**0.19**
Food Products	**0.51**	**0.08**	**0.86**	**0.14**
Wood Products	**0.20**	**0.45**	**0.31**	**0.69**
Machinery	**1.16**	**-0.13**	**1.00**	**0.00**
Miscellaneous	**0.44**	**0.16**	**0.73**	**0.27**
Paper Products	**0.14**	**0.08**	**0.65**	**0.35**
Primary Metal	**0.20**	**-0.03**	**1.00**	**0.00**
Household Goods	**0.21**	**0.09**	**0.71**	**0.29**
Waste Materials	**0.56**	**0.07**	**0.88**	**0.12**
Unknown	**0.28**	**0.08**	**0.79**	**0.21**


N
W
E
S
Source: GDOT Southwest Interstate Study
Southwest Georgia Interstate Study
Southwest Georgia Model Zones
Truck Trip Table Development
Figure 1.2.4.1

Before performing the disaggregation of the trip table, a zonal equivalency table had to be developed to link the 1,569 Southwest Interstate model zones to the 67 GFA regions. The equivalency between the two geographic levels was established by identifying the zones and their associated GFA region in which they are located. The weighted SE data for all zones within each GFA region was calculated and summarized, and the percent share of the SE data for each zone relative to the total SE data for the GFA region was calculated. The calculated share of weighted SE data for each zone is considered a direct reflection of the freight share for that zone relative to the total freight for the GFA region.

There is a slight difference, however, in the zonal equivalency for International Overseas table and for North America table. While the regions in the International Overseas table reflect the 65 GFA zones, the regions in the North America table only contain 64 GFA zones. The two (2) missing zones in the International Overseas tables are Canada and Mexico, which are replaced and represented by U.S. ports. The three (3) missing zones in the North America trip tables are Savannah in Georgia, Charleston in South Carolina, and Mobile in Alabama, and they are ,however, not represented else where in the North America data tables in FAF^2. In other words, the original FAF^2 data does not reflect the commodity flows to and from these three zones in either the domestic or international border table. Nevertheless, the commodity flows associated with the three zones are reflected in the International Overseas table, mainly because they all represent the major U.S. sea ports. Therefore, to estimate the commodity flows associated with non-port activities from the three port zones for the North America trip tables, commodity flows in the rest of state in which the ports belong to have to be distributed to these ports. This was done by adjusting the equivalency table to add back the three missing port zones into the North America trip tables during the disaggregation process. There was no adjustment required for the equivalency table for International Overseas. Table 1.2.4.3 shows few records of the zonal equivalency and freight share data for the Chemical commodity group.

Table 1.2.4.3
Sample GFA Zone to Southwest Georgia TAZ Disaggregated Freight Share

GFA Zone	Southwest TAZ	Freight Share	
		North America	International Overseas
2	1099	0.1228	0.1493
2	1100	0.1483	0.1802
2	1101	0.1192	0.1448
2	1102	0.1049	0.1275
2	1103	0.0764	0.0929
2	1104	0.072	0.0876

Finally, border crossing commodity flows at U.S and Mexico and U.S. and Canada borders had to be estimated in order to assign the appropriate amount of commodity flows at each border crossing. The current Southwest Georgia model has three (3) northern external zones in Canada, and two (2) in Mexico. The disaggregation process had to distribute commodity flows to and from Canada to the three (3) northern externals and to and from Mexico to the two (2) southern externals. To develop distribution share factors, commodity flows at border crossings in the FAF[2] database were summarized at key ports of entry, and the amount at a particular crossing relative to the amount of total crossing were used to calculate the distribution share. This method was applied to both northern and southern border crossing respectively to obtain relative commodity flow share for each external zone. Table 1.2.4.4 shows the external equivalency zones and their relative share of commodity flows.

Table 1.2.4.4
Raw and Weighted Coefficients for SE data

External Zone	Southwest Zone	Port of Entry	Kton	Share	Total Kton
Northern	1565	MI Detroit	**41,573**	**47%**	**87,973**
	1566	NY Buffalo	25,737	**44%**	
		NY Rochester	0		
		NY-Alexandria Bay	5,390		
		NY-Champlain/Rouses Point	7,443		
		Total	**38,569**		
	1567	WA Seattle	129	**9%**	
		WA-Blaine	7,702		
		Total	**7,831**		
Southern	1568	CA San Diego	**5,851**	**6%**	**94,796**
	1569	TX-Brownsville/Hidalgo	10,509	**94%**	
		TX-El Paso	35,959		
		TX-Laredo	42,476		
		Total	**88,945**		

Once the freight share and zonal equivalency were established, commodity flow disaggregation was performed on the GFA North America trip tables and GFA International Overseas trip tables respectively. This process created a total of 24 1,569 by1,569 trip matrices: two matrices for each commodity group, one for North America flows and one for International Overseas flows. The two matrices for each commodity group were then combined to create the final 12 trip tables each for a commodity group.